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14. ABSTRACT A pulsed power lecture series coordinated by Texas Tech University for the U.S. Air Force is described. A total of 46 lectures have been presented by various experts in the field and some 25 instructional modules have been printed so far. The nature of the lectures and the instructional modules is described. The experience with using these modules in regular classroom teaching is discussed.					
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PULSED POWER EDUCATION*
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Abstract

A pulsed power lecture series coordinated by Texas Tech University for the U.S. Air Force is described. A total of 46 lectures have been presented by various experts in the field and some 25 instructional modules have been printed so far. The nature of the lectures and the instructional modules is described. The experience with using these modules in regular classroom teaching is discussed.

INTRODUCTION

For the past three years the Department of Electrical Engineering at Texas Tech University has conducted a Pulsed Power Lecture Series for the U.S. Air Force. Some of the lectures have been given by Texas Tech faculty but most of the lecturers have come from various industrial and national laboratories. The funding for this program, which is nearing its end, has been provided through AFOSR. The lectures are given at the Air Force Institute of Technology at Wright-Patterson Air Force Base one day and then repeated at the Air Force Weapons Laboratory the next day. Coordinators for the technical program are M. Kristiansen and A. Guenther, while the local coordinators are T. Skvarenina at AFIT and J. Ungvarsky at AFWL. An Advisory Committee consisting of the following members have advised on the lecture selection.

B. Guenther	Army Research Office
R. Gullickson	Defense Advanced Research Project Agency
S. Levy	U.S. Army ERADCOM
T. Martin	Sandia National Laboratories
R. Parker	Naval Research Laboratory
F. Rose	Naval Surface Weapons Center, Dahlgren Labs
P. Turchi	R & D Associates
I. Vitkovitsky	Naval Research Laboratory

Each lecturer is asked to prepare a written set of lecture notes (modules) which is distributed to the lecture participants. The lectures are open to selected industry personnel. The modules are also being used in undergraduate and graduate pulsed power engineering courses at Texas Tech University.

The following lectures have been presented to date. Those which have been printed are marked with (P).

* Supported by AFOSR

+ Present address: Physics Department
Auburn University

1. "Introduction to Pulsed Power"
A.H. Guenther - Air Force Weapons Laboratory
- 2.(P)"Some Basic Concepts and Fundamentals of H.V. Generators"
M. Kristiansen - Texas Tech University
- 3.(P)"Basic Electromagnetic Field Theory"
M. Kristiansen - Texas Tech University
- 4.(P)"Circuit and Transmission Line Theory"
M.O. Hagler - Texas Tech University
- 5.(P)"Electric and Magnetic Properties of Materials"
E.E. Kunhardt - Texas Tech University
- 6.(P)"Diodes, Electron Beams and Bremsstrahlung"
R.K. Parker and C.A. Kapetanakis
Naval Research Laboratory
7. "Prime Power"
F.C. Brockhurst - Air Force Institute of Technology
- 8.(P)"Mechanical Energy Storage and Electromechanical Energy"
W. Weldon - The University of Texas at Austin
- 9.(P)"Principal Features in Large Capacitor Banks"
E.L. Kemp - Los Alamos National Laboratory
- 10.(P)"Energy Storage Capacitors"
W.J. Sarjeant - Los Alamos National Laboratory
- 11.(P)"Marx Generators"
T.H. Martin - Sandia National Laboratories
12. "Other Voltage Multiplier Scheme Variants"
Ken Prestwich - Sandia National Laboratories
13. "Inductive Energy Storage"
P. Turchi - R & D Associates
14. "Explosive Generators"
W. Cowan - Sandia National Laboratories
- 15.(P)"Chemical Energy Storage"
W.S. Bishop - AF Wright Aeronautical Laboratories
16. "Pulsed MHD Generators"
C. Bangerter - STD Research Corporation

- 17.(P)"Power Conditioning"
G.K. Simcox - Raytheon Company
- 18.(P)"Transformers"
J. O'Loughlin - Air Force Weapons Laboratory
- 19.(P)"Pulse Forming Networks"
V.P. VanDevender - Sandia National Laboratories
- 20.(P)"Pulse Forming Networks"
R. Butcher - Los Alamos National Laboratory
21. "Gas Breakdown"
E.E. Kunhardt - Texas Tech University
- 22.(P)"Vacuum Switching"
A.S. Gilmour - State University of N.Y./Buffalo
- 23.(P)"Solid State Switching"
W.M. Portnoy - Texas Tech University
24. "Thyratrons"
D. Turnquist - E G & G
- 25.(P)"Magnetic Switches and Circuits"
W.C. Nunnally - Los Alamos National Laboratory
26. "Ignitron Switches"
D. Cummings - Physics International Company
- 27.(P)"Mechanical Switches"
M. Parsons - Los Alamos National Laboratory
28. "Breakdown in Water"
R. Miller - Maxwell Laboratories, Inc.
- 29.(P)"Current Interruption-Explosive and Fuse Switching"
I. Vitkovitsky - Naval Research Laboratory
- 30.(P)"Solid State and Gaseous Switches"
J.C. Martin - UKAWRE, Aldermaston, Reading, England
31. "Gas Insulated Spark Gaps"
M.O. Hagler and M. Kristiansen
Texas Tech University
32. "Repetitive Switches"
M. Buttram - Sandia National Laboratories
- 33.(P)"Electro-Magnetic Field Measurements"
C. Baum - Air Force Weapons Laboratory
- 34.(P)"Opening Switches"
K.H. Schoenbach - Texas Tech University
35. "Current and Voltage Measurements"
R. Hebner - National Bureau of Standards
- 36.(P)"Electromagnetic Forming of Metals"
Mike Plum - Maxwell Laboratories, Inc.
- 37.(P)"Grounding and Shielding, Computer Interfacing and Control of Pulsed Power Systems"
George Chandler - Los Alamos National Laboratory
38. "Soviet Pulse Power Technology"
Simon Kassel - Rand Corporation
- 39.(P)"Microwave Directed Energy"
V.L. Granatstein - Naval Research Laboratory
- 40.(P)"Charged Particle Beam Weapons"
W.A. Barletta - Lawrence Livermore National Laboratory

41. "Particle Beam Fusion"
Glenn Kuswa - Sandia National Laboratory
42. "Electromagnetic Launchers"
Ronald S. Hawke
Lawrence Livermore National Laboratory
43. "New Model of the Electromagnetic Field Applied to Present Pulsed Power Technology"
Raymond O'Rourke - O'Rourke and Associates
44. "Vacuum Power Flow"
Marco S. Di Capua - Physics International
45. "High Current Beam Transport in Linear Accelerators"
Bruce Miller - Sandia National Laboratories
46. "High Current Cyclic Accelerators"
Jeff Golden - Naval Research Laboratory

It is planned to organize approximately 2-3 additional lectures on such topics as: "Space-based Power Sources" and "Recent Advances in Solid State Switching". The program is scheduled to terminate on September 30, 1983 and the main efforts are concentrated on getting more of the lecture modules printed before the program termination.

USE OF LECTURE MODULES IN

PULSED POWER EDUCATION AT TEXAS TECH UNIVERSITY

The lecture modules described above are used in both the undergraduate and graduate courses in pulsed power engineering at TTU. Some of the notes are used only at the undergraduate level (e.g. Notes No. 2, 3, and 4) whereas others are used only in the graduate course (e.g. Notes No. 6, 39, and 40).

Since there is no modern textbook available in this field, the notes have proven invaluable in teaching these courses. The student response to the notes has been generally favorable. They realize that they are receiving material which is otherwise not readily available and many of them have tried to obtain copies of the notes even if they have not taken the course(s).

The notes have been printed in a limited number, in addition to those distributed to the participants in the lecturer series. In the future, it will not be possible to distribute them without charge and methods are being sought to ensure future distribution to interested parties. Among the methods considered are:

1. Publish some of the notes in book form through a regular commercial publisher.
2. Publish the notes in their present form and sell them at cost from Texas Tech University.
3. Reissue the notes in a few volumes and make them available through the Defense Technical Information Center.

There are advantages and disadvantages with all the above arrangements. Comments and suggestions for other arrangements are solicited.